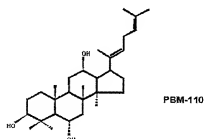


6), δ 47.69 (C-7), δ 41.48 (C-8), δ 50.55 (C-9), δ 39.48 (C-10), δ 32.02 (C-11), δ 72.63 (C-12), δ 50.47 (C-13), δ 50.73 (C-14), δ 32.69 (C-15), δ 27.52 (C-16), δ 50.92 (C-17), δ 17.80 (C-18), δ 17.70 (C-19), δ 140.11 (C-20), δ 13.23 (C-21), δ 124.63 (C-22), δ 30.04 (C-23), δ 78.00 (C-24), δ 149.90 (C-25), δ 110.54 (C-26), δ 17.80 (C-27), δ 28.94 (C-28), δ 16.56 (C-29) and δ 17.14 (C-30).

Sapogenin PBM-110

Dammara-20(22E)-diene-3,6,12-triol (so named as PBM-110)

- 10 (1) Structural formula:



- (2) Molecular formula: $C_{30}H_{50}O_3$

- (3) Molecular weight: 458.722

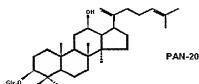
- 15 (4) The 1H -NMR spectrum (300 MHz, C_5D_5N) has shown signals at δ 5.31 (1H, br.t), δ 5.51 (1H, t, $J=7.2$ Hz), δ 2.01 (3H, s), δ 1.85 (3H, s), δ 1.65 (3H, s), δ 1.64 (3H, s), δ 1.47 (3H, s), δ 1.19 (3H, s), δ 1.03 (3H, s) and δ 1.01 (3H, s).

- 20 (5) The ^{13}C -NMR spectrum (75.4 MHz, C_5D_5N) has shown signals at δ 39.48 (C-1), δ 27.52 (C-2), δ 78.48 (C-3), δ 40.42 (C-4), δ 61.86 (C-5), δ 67.77 (C-6), δ 47.69 (C-7), δ 41.48 (C-8), δ 50.55 (C-9), δ 39.48 (C-10), δ 32.02 (C-11), δ 72.63 (C-12), δ 50.47 (C-13), δ 50.73 (C-14), δ 32.69 (C-15), δ 27.52 (C-16), δ 50.92 (C-17), δ 17.80 (C-18), δ 17.70 (C-19), δ 140.11 (C-20), δ 13.23 (C-21), δ 124.63 (C-22), δ 30.04 (C-23), δ 124.63 (C-24), δ 131.33 (C-25), δ 25.76 (C-26), δ 17.50 (C-27), δ 28.94 (C-28), δ 16.56 (C-29) and δ 17.14 (C-30).

Sapogenin PAN-20

3-O-β-D-glucopyranosyl-dammara-20(21)-diene-3,12-diol (named as PAN-20)

(1) Structural formula:

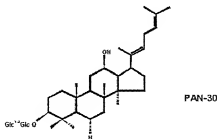


- 5 (2) Molecular formula: $C_{36}H_{60}O_7$
- (3) Molecular weight: 604.863
- (4) The 1H -NMR spectrum (300 MHz, C_5D_5N) has shown signals at δ 4.92 (1H, d, $J=7.5$ Hz), δ 5.29 (1H, br.t), δ 5.14 (1H, s), δ 4.90 (1H, s), δ 1.66 (3H, s), δ 1.60 (3H, s), δ 1.30 (3H, s), δ 1.02 (3H, s), δ 0.98 (3H, s), δ 0.98 (3H, s) and δ 0.81 (3H, s).
- 10 (5) The ^{13}C -NMR spectrum (75.4 MHz, C_5D_5N) for aglycon moiety has shown signals at δ 39.34 (C-1), δ 27.13 (C-2), δ 88.82 (C-3), δ 40.26 (C-4), δ 56.47 (C-5), δ 18.52 (C-6), δ 35.40 (C-7), δ 37.12 (C-8), δ 50.91 (C-9), δ 39.74 (C-10), δ 32.73 (C-11), δ 72.47 (C-12), δ 48.30 (C-13), δ 51.26 (C-14), δ 32.74 (C-15), δ 26.78 (C-16), δ 52.52 (C-17), δ 15.86 (C-18), δ 16.52 (C-19), δ 155.58 (C-20), δ 108.19 (C-21), δ 33.91 (C-22), δ 30.82 (C-23), δ 125.39 (C-24), δ 131.25 (C-25), δ 25.81 (C-26), δ 17.81 (C-27), δ 28.73 (C-28), δ 16.83 (C-29) and δ 17.05 (C-30). The ^{13}C -NMR spectrum (75.4 MHz, C5D5N) for 3-glucopyranosyl has shown signals at δ 107.00 (C-1"), δ 75.82 (C-2"), δ 78.79 (C-3"), δ 71.94 (C-4"), δ 78.39 (C-5") and δ 63.14 (C-6").
- 15
- 20

Sapogenin PAN-30

3-O-[[β -D-glucopyranosyl(1 \rightarrow 2)- β -D-glucopyranosyl]-dammara-20(22E)-diene-3,12-diol (named as PAN-30)

(1) Structural formula:



(2) Molecular formula: $C_{42}H_{70}O_{12}$

(3) Molecular weight: 766.587

(4) The ^{13}C -NMR spectrum (75.4 MHz, CD_5N) has shown signals at δ 39.17 (C-1), δ 28.00 (C-2), δ 88.82 (C-3), δ 40.14 (C-4), δ 56.29 (C-5), δ 18.33 (C-6), δ 35.24 (C-7), δ 39.60 (C-8), δ 50.66 (C-9), δ 36.91 (C-10), δ 32.10 (C-11), δ 72.49 (C-12), δ 50.33 (C-13), δ 50.91 (C-14), δ 32.54 (C-15), δ 26.64 (C-16), δ 50.80 (C-17), δ 16.35 (C-18), δ 16.49 (C-19), δ 140.06 (C-20), δ 13.07 (C-21), δ 123.21 (C-22), δ 27.35 (C-23), δ 123.54 (C-24), δ 131.16 (C-25), δ 25.60 (C-26), δ 17.66 (C-27), δ 28.73 (C-28), δ 15.72 (C-29) and δ 16.92 (C-30).

[0033] The inventors herein have discovered that the dammarance sapogenin structure that is modified to be specifically clean of any sugar moieties (glycons) at any position and free of hydroxyl at C-20 has surprisingly improved effectiveness in treating cancers, particularly in treating multi-drug resistant cancers, compared to sapogenins that have sugar moieties on the structure or a hydroxyl at C-20. The inventors have unexpectedly found that PAM-120, PBM-110 and PBM-100, which all fall into this chemical category, have greater anti-cancer effect than other known saponins and sapogenins. In particular, these three sapogenins, and especially PAM-120, show surprisingly effective activity in the treatment of multi-drug resistant cancers.